kota, 84; upper Mississippi, 94; Missouri Valley, 74; northern Slope, 77; middle Slope, 55; southern Slope (Abilene), 39; southern Plateau, 85.

The years of greatest and least precipitation for August are given in the REVIEW for August, 1890. The precipitation for the current month was the greatest on record at: Meridian, 6.39; Spokane, 1.48; Carson City, 1.30; Walla Walla, 1.24; Winnemucca and Eureka, 0.70; Red Bluff, 0.54; Sacramento, 0.20; Fresno, 0.15; San Francisco, 0.09. It was the least on record at: Wilmington, 2.48; Columbia, 2.38; Atlanta, 1.97; Chattanooga, 1.90; Harrisburg, 1.45; Fort Smith, 1.31; Knoxville, 1.25; Charlotte, 1.05; Philadelphia, 0.46; Galveston, 0.35.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 13; Arizona, 4, 15, 16, 17, 20, 23, 24, 25. Arkansas, 10, 22. California, 16, 30. Colorado, 5, 11, 13, 18, 19, 21 to 24, 30. Connecticut, 14, 19. Delaware, 13. Georgia, 11, 14. Idaho, 3, 20, 21. Illinois, 5, 11, 13, 15, 22, 23. Indiana, 1, 5, 6, 7, 15, 22, 23. Iowa, 4, 5, 9, 13, 14, 15, 21, 26. Kansas, 9, 21, 22, 25. Kentucky, 1, 12, 13. Louisiana, 18. Maine, 18. Massachusetts, 15, 18, 19. Michigan, 1, 4, 5, 8 to 11, 14, 15, 25, 26, 29. Minnesota, 1 to 4, 6, 7, 8, 10, 13 to 16. Missouri, 8, 9, 13, 22. Montana, 1, 6, 7, 8, 16. Nebraska, 4, 6, 10, 13 to 16, 30. Nevada, 16, 18, 19, 20, 23, 28. New Hampshire, 18, 19. New Jersey, 13, 18. New Mexico, 31. New York, 9, 12, 18. North Carolina, 3, 13. North Dakota, 2, 3, 5 to 8, 14, 19. Ohio, 1, 9, 10, 15, 22, 23. Oregon, 27. Pennsylvania, 16, 18. Rhode Island, 19. South Dakota, 7, 8, 10, 13, 19, 20. Texas, 16, 25. Utah, 16, 21, 22. Vermont, 18. Virginia, 13, 15. Washington, 27. Wisconsin, 4, 5, 9, 25.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 18 regular stations of the Weather Bureau by its photographic, and at 24 by its thermal effects. At one station records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric sheets show seventy-fifth meridian time; for convenience the results are all given in Table XI for each hour of local mean time.

Photographic and thermometric registers give the duration of that intensity of sunshine which suffices to make a record, and, therefore, they generally fail to record for a short time after sunrise and before sunset, because, even in a cloudless sky, the solar rays are then too feeble to affect the self-registers. If, therefore, such records are to be used for determining the amount of cloudiness, they must be supplemented by special observations of the sky near the sun at these times. The duration of clear sky thus specially determined constitutes the so-called twilight correction (more properly a low-sun correction), and when this has been applied, as has been done in preparing Table XI, there results a complete record of the clearness of the sky from sunrise to sunset in the neighborhood of the sun. The twilight correction is not needed when the self-registers are used for ascertaining the duration of a special intensity of sunshine, but is necessary when the duration of cloudiness is alone desired, as is usually the case.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table XI.

COMPARISON OF DURATIONS AND AREAS.

The sunshine registers give the *durations* of effective sunshine whence the duration relative to possible sunshine is derived; the observer's personal estimates give the percentage of *area* of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for August, 1896, is 8 per cent photographic and 10 per cent for thermometric records.

The details are shown in the following table, in which the stations are arranged according to the greatest possible duration of sunshine, and not according to the *observed* duration as heretofore.

Difference between instrumental and personal observations of sunshine.

Stations.	Apparatus.	Total possible duration for the whole month.	Personal estimated area of clear sky.	Instrumental record of sunshine.			
				Photographic.	Difference.	Thermometric.	Difference.
		Hrs.	%	%	%	%	%
Bismarck, N. Dak.	P.	440.0	65	75	+10	.....	.....
Helena, Mont.	P.	440.0	64	71	+ 7	.....	.....
Portland, Oreg.*	T.	437.6	54	.....	.....	43	−11
	P.	437.6	54	44	−10	.....	.....
Eastport, Me.	P.	435.6	39	52	+13	.....	.....
Minneapolis, Minn	T.	435.6	.....	.....	.....	71	.....
Northfield, Vt	P.	433.6	45	60	+15	.....	.....
Portland, Me	T.	433.6	42	.....	.....	61	+19
Buffalo, N. Y	T.	431.3	38	.....	.....	71	+33
Rochester, N. Y	T.	431.3	57	.....	.....	62	+ 5
Boston, Mass	T.	429.4	54	.....	.....	61	+ 7
Chicago, Ill	T.	429.4	69	.....	.....	82	+13
Cleveland, Ohio	P.	429.4	53	64	+11	.....	.....
Des Moines, Iowa	T.	429.4	55	.....	.....	62	+ 7
Dubuque, Iowa†	T.	.....	.....	.....	.....	.....	.....
Detroit, Mich.	T.	429.4	53	.....	.....	68	+15
Eureka, Cal.	P.	427.4	36	27	− 9	.....	.....
New York, N. Y.	T.	427.4	61	.....	.....	59	− 2
Omaha, Nebr	P.	427.4	52	62	+10	.....	.....
Salt Lake City, Utah	P.	427.4	54	77	+23	.....	.....
Columbus, Ohio	T.	425.2	45	.....	.....	55	+10
Denver, Colo.	P.	425.2	56	63	+ 7	.....	.....
Philadelphia, Pa.	T.	425.2	55	.....	.....	82	+27
Baltimore, Md.	T.	423.2	60	.....	.....	64	+ 4
Cincinnati, Ohio	T.	423.2	64	.....	.....	83	+19
Kansas City, Mo.	P.	423.2	68	72	+ 4	.....	.....
St. Louis, Mo	T.	423.2	69	.....	.....	81	+12
Washington, D. C.	P.	423.2	69	74	+ 5	.....	.....
Dodge City, Kans.	P.	422.1	70	78	+ 8	.....	.....
Louisville, Ky	T.	422.1	73	.....	.....	85	+12
San Francisco, Cal.	T.	422.1	55	.....	.....	65	+10
Fresno, Cal.	T.	420.1	83	.....	.....	87	+ 4
Santa Fe, N. Mex.	P.	418.7	52	71	+19	.....	.....
Little Rock, Ark.	T.	417.1	63	.....	.....	84	+21
Wilmington, N. C.	T.	415.8	57	.....	.....	69	+12
Atlanta, Ga†	T.	.....	.....	.....	.....	.....	.....
Phœnix, Ariz.	P.	414.0	60	85	+25	.....	.....
San Diego, Cal.	P.	414.0	82	71	−11	.....	.....
Savannah, Ga.	P.	412.6	61	67	+ 6	.....	.....
Vicksburg, Miss	T.	412.6	70	.....	.....	76	+ 6
New Orleans, La.	T.	409.7	62	.....	.....	63	+ 1
Galveston, Tex.	P.	408.0	72	80	+ 8	.....	.....

*Record by both methods. †Record incomplete.

WIND.

The *prevailing winds* for August, 1896, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

The *resultant winds*, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table IX. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assump-

tion that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

HIGH WINDS.

Maximum wind velocities of 50 miles or more per hour were reported during this month at regular stations of the Weather Bureau as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				*Miles*	
Cincinnati, Ohio	1	50	nw.	Omaha, Nebr	15	50	ne.
Cleveland, Ohio	10	58	w.	Port Huron, Mich	8	52	n.
Milwaukee, Wis	9	52	w.	St. Paul, Minn	4	60	nw.
New York, N. Y	9	50	nw.	Winnemucca, Nev	30	50	w.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table X, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which reports of thunderstorms for the whole country were most numerous were: 9th, 239; 10th, 230; 13th, 208; 14th, 235; 15th, 208; 16th, 216; 22d, 224.

Thunderstorm reports were most numerous in: Michigan, 229; Missouri, 270; North Carolina, 221; Ohio, 284.

Thunderstorms were most frequent in: Colorado, 26 days; Florida and New Mexico, 31; Louisiana, 28; Mississippi and Missouri, 25.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 18th to the 26th, inclusive. On the remaining twenty-two days of this month 216 reports were received, or an average of about 10 per day. The date on which the number of reports especially exceeded this average were: 1st, 30; 6th, 73; 9th, 25.

Auroras were reported by a large percentage of observers, as follows: North Dakota, 82; Montana, 62; Minnesota, 43; Michigan, 18.

Auroras were reported most frequently in: North Dakota, 14 days; Minnesota, Montana, and Wisconsin, 11; Michigan, 7.

CANADIAN REPORTS.

Thunderstorms were reported as follows: St. Johns, 3d; Halifax, 19th; Yarmouth, 9th, 10th, 19th; Charlottetown, 4th, 5th; Chatham and Father Point, 9th; Quebec, 4th, 7th, 16th; Montreal, 9th, 16th, 23d; Rockliffe, 6th, 29th; Toronto, 5th, 6th, 10th, 12th, 23d. Ottawa, 9th, 16th; Port Stanley, 1st, 2d, 6th, 8th to 12th, 16th, 23d, 26th; Saugeen, 5th, 8th, 18th, 23d, 30th; Parry Sound, 5th 8th, 15th, 23d, 26th, 29th, 30th; Port Arthur, 14th, 20th, 25th; Winnipeg, 2d, 21st; Minnedosa, 1st, 2d, 3d, 5th, 7th, 9th, 11th; Qu'Appelle, 8th, 10th, 19th, 20th; Medicine Hat, 2d, 9th, 12th, 13th; Swift Current, 2d, 9th, 11th, 16th, 20th; Calgary, 19th; Prince Albert, 7th, 8th, 18th, 19th.

Auroras were reported as follows: Sydney, 1st, 6th, 29th; Halifax, 1st; Yarmouth, 1st, 17th, 19th; Charlottetown, 1st, 6th, 29th; Father Point, 2d, 4th, 12th, 13th, 14th, 17th, 19th; Quebec, 1st, 2d, 4th, 7th, 9th, 17th, 20th, 24th, 29th; Montreal, 9th, 17th; Rockliffe, 7th, 8th; Toronto, 17th; Parry Sound, 6th; Port Arthur, 7th; Winnipeg, 9th, 12th, 13th, 17th, 19th, 26th, 27th; Minnedosa, 6th, 9th, 12th, 13th, 19th; Qu'Appelle, 1st; Medicine Hat, 16th, 19th; Calgary, 6th; Prince Albert, 1st, 6th, 8th, 10th, 18th, 21st, 25th.

INLAND NAVIGATION.

The *extreme and average stages of water* in the rivers for the current month are given in Table VIII, from which it appears that the Ohio, at Evansville, Ind., was 0.5 above the danger line on the 6th. The only other river that approached danger was the Wabash, at Mount Carmel, Ill., on the 1st. No special reports of damage were made in either of these cases, and, in general, the rivers maintained their usual summer stage.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective services.

Snowfall and rainfall are expressed in inches.

Alabama.—The mean temperature was 82.2°, or 3.3° above normal; the highest was 106°, at Thomasville on the 1st, and the lowest, 50°, at Newburgh on the 28th. The average precipitation was 2.30, or 1.71 below normal; the greatest monthly amount, 9.22, occurred at Daphne, and the least, 0.40, at Scottsboro. The drought which had its beginning during the second decade of July over the central and northern portions of the State has continued practically unbroken during the present month. The effect of the weather on growing crops has been very unfavorable, cutting short the prospective yield of all very materially. All large streams are very low, and the smaller creeks, in many instances, are entirely dry. There is complaint of scarcity of water for stock from the central and western portions of the State.

Arkansas.—The mean temperature was 82.6°, or 4.5° above normal; the highest was 112°, at Malvern on the 6th, and the lowest, 48°, at Camden and Keesees Ferry on the 29th. The average precipitation was 2.32, or 0.90 below normal; the greatest monthly amount, 5.75, occurred at Marvell, and the least, 0.50, at Fulton. The drought that prevailed during July was not generally broken until August 18 and 19. This prolonged dry weather, together with the abnormal heat, did great damage to cotton and corn, the former being almost a total failure on the uplands and generally a poor crop on the lowlands. Corn is a very poor crop. The rains during the latter part of the month were beneficial to minor crops and pastures and enabled farmers to begin stubble breaking, and many began sowing rye and oats for winter pasture.

California.—The mean temperature was 73.8°, or 0.1° above normal; the highest was 125°, at Volcano Springs, and the lowest, 26°, at Bodie on the 3d. The average precipitation was 0.32, or 0.29 above normal; the greatest monthly amount, 1.83, occurred at Bodie, while none fell at various places.

Colorado.—The mean temperature was 66.0°, or 1.0° above normal; the highest was 107°, at Lamar on the 9th and 10th, and the lowest, 26°, at Cameron Pass on the 23d. The average precipitation was 1.68, or about normal; the greatest monthly amount, 4,96, occurred at Thon, and the least, 0.27, at Saguache.

Florida.—The mean temperature was 82.0°, or 0.2° above normal; the highest was 100°, at McClenny on the 18th, and the lowest, 58°, at Emerson on the 30th. The average precipitation was 5.81, or 1.93 below normal; the greatest monthly amount, 14.57, occurred at Manatee, and the least, "trace," at Carrabelle. High temperatures and absence of well distributed rains during the first two decades caused a rapid deterioration of nearly all crops, but markedly so of cotton and corn, while minor crops were by no means exempt from injury

Idaho.—The mean temperature was 66.3°; the highest was 103°, at Payette on the 23d, and the lowest, 28°, at Chesterfield on the 5th. The average precipitation was 0.87; the greatest monthly amount, 2.18, oc-